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ABSTRACT

The use of analytical models and quantitative methods for both short- and long-range problem solving offer library managers an excellent opportunity to improve and rationalize decision-making for strategic and organizational planning. The first step is to identify the problems confronting the library and understand its current capabilities. Several dimensions of planning--scope, time frame, nature of decision, and staff involvement--must be considered in the development of a planning strategy. Recognizing these dimensions, planners will be able to focus on the critical issues and to apply the most appropriate quantitative and computational techniques. Critical issues that demand primary attention in the planning process include the information system needed to support strategic planning, the allocation of resources, the analytical approaches to understanding the library environment, the relationships of organizational processes and climate to effective planning, and the assessment of library performance. A comprehensive planning framework should approach the library as a complex dynamic system with interdependent relationships and changing characteristics. Utilization of decision models developed for libraries and computer applications, along with proper staff management, make efficient library planning possible. (CWM)

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IMPROVING LIBRARY PERFORMANCE:

QUANTITATIVE APPROACHES TO LIBRARY PLANNING

by

Duane E. Webster

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ASSOCIATION OF RESEARCH LIBRARIES

OFFICE OF UNIVERSITY LIBRARY MANAGEMENT STUDIES
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IMPROVING LIBRARY PERFORMANCE: QUANTITATIVE APPROACHES TO LIBRARY PLANNING

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I. INTRODUCTION: THE RATIONALE FOR IMPROVED PLANNING PROCESS

In library management, planning and decision-making occur on at least two levels--strategic and operational. Strategic planning involves decisions regarding the allocation of resources over an extended period of time and the long-term relationships of the library with its environment. Operational planning involves a much shorter time frame and the resolution of specific problems, usually of an internal nature.

For a number of reasons, libraries are experimenting to improve both types of planning. Management must make strategic decisions to respond to current and anticipated changes in the environment, including stabilized budgets, inflation, and a continuing information explosion. These changes prevent most libraries from maintaining equivalency in historical collection patterns and strengths. In addition, emerging staff needs, expectations, and values are forcing new definitions of managerial roles and effectiveness. Changing patterns of library use and user interests also are providing opportunities to redefine and strengthen basic library service. Out of a mix of these pressures,

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forces, and opportunities, libraries are finding that the current concept of the primary purposes of large, research libraries may not be economically feasible or workable in the future. As a result, library managers need planning processes that can help resolve the dilemma of attempting to do more with less.

Specifically, management might well have to make strategic decisions concerning the financial and performance implications of initiating machine-based information services, building remote storage facilities, or implementing computer-based circulation systems. Such actions need to be reviewed in terms of the potential benefits to the library and the cost of their design and implementation. Furthermore, in a period of stable budgets, doing something new or different requires giving up something else to compensate. This forces hard executive decisions that must be justified and defended.

One thing is clear about these strategic decisions. They occur in relatively open system environments--systems where variables cannot be quantified and sophisticated computation techniques cannot be applied. Long-range decisions facing libraries must take into account environmental, technological, and social forces that are not susceptible to rigid definition and precise manipulation within a simple problem-solving procedure. Hard information on these forces is not available readily, and staff willingness to accommodate new directions must be carefully cultivated. Decision-makers must examine broad fundamental concerns regarding the role and objectives of libraries and provide the leadership that can result in resolution of sub-problems and the integration of these solutions into a total system.

Operational planning, on the other hand, is concerned with a much shorter time frame and the resolution of specific problems with fewer variables. For example, given a reduction in the current budget, managers can take advantage of quantifiable and computational techniques to determine where cuts can be made so as not to interfere with performance.

A recent survey of American libraries[1] indicated that a general approach to accomodating budget cuts includes decisions to: reduce duplicate serial subscriptions, reduce purchase of monographs, freeze hiring of new staff, prune nonessential activities/staff, and look for more money. These decisions seem to be made on the basis of identifying immediate cost savings. The survey indicated that staff are frequently involved in the decision-making process, but there were no documented efforts to apply analytical or quantitative decision methods.

Analytical models for problem-solving appear to offer library planners an excellent opportunity to improve and rationalize decision-making. The challenge here is not the design or technology of analytical models, but the correct application of available models to answer the questions asked in libraries today. This process must start with identifying types of questions; library managers must confront the decisions that they are expected to make. The following are examples of internal short-range practical decisions for which analytical models exist.

- Determining optimal lengths of loan period
- Scheduling staff to meet cyclical use levels
- Determining optimal acquisition policies to maximize use
- Rationalizing the division of purchases among serials and monographs
- Selecting journals
- Assessing collections

involved in the decision-making process, but there were no documented efforts to apply analytical or quantitative decision methods.

Despite the need, numerous forces limit formal planning in libraries. Rapid changes in libraries' environments (e.g. The experience of some libraries in working with 3 university executives in less than 5 years or onserving an 80% jump in the price of a journal over the same time.) make elaborate systems impractical. The frustration that comes with seeing well-designed plans fail because of unexpected changes invariably discourages library managers from investing a great deal of effort in formal planning efforts.

Also contributing to the lack of formal planning are the library managers themselves, who often tend to rely on past success with intuitive and very personal decision-making styles. This tendancy comes partly from a lack of training in more elaborate planning methodology and partly from a lack of role models to emulate. Most university administrators, for example, are only starting to demonstrate an interest in or sophistication with the newer management techniques.

Another limiting force is the political circumstances in most universities that place a premium on strong, agile, and sensitive relationships. Frequently, it is more important to know who makes decisions than to be part of an elaborate planning process that may be out of tune with the real power. Parent institutions rarely operate formal planning systems and even more rarely require that libraries operate them.

Other obstacles limit library applications of available quantitative planning methods. A basic problem is that quantitative techniques operate best in a closed system environment where variables can be isolated.

Thus the potential of mathematical or computational techniques is greatly reduced in an open, dynamic system such as a university library. Additionally, many formal planning methods are too sophisticated for present library application. Such methods often cost too much when compared to presumed benefits. Libraries frequently are too small and informal to deserve development of specialized planning methods. And the experts in system design continue to ask questions that are small, narrow, and not tuned to these organizational realities.[3]

Planners must take into account attitudes that are present and the underlying factors that influence these attitudes. Because the planning process can introduce new directions for a library, staff resistance to change can be encountered. This resistance is characterized by internal maneuvering for limited money, opposition to major initiatives to study library operations, and claims that the parent institutions or users do not understand or appreciate the value of work performed. Also, stable user expectations tend to limit the degree to which the library can introduce innovative practices. Underlying these attitudinal issues is the basic nature of libraries which are built around huge collections and elaborate bibliographic structures that limit flexibility.

In most strategic and operational planning, it is impossible to mold all the various factors management must consider into explicit well-defined models that can be quantified and solved via computational techniques. Recognizing this, however, managers can develop a strengthened planning capability oriented toward making changes in libraries' capacities, structures, and programs. Improving performance should be the primary incentive, with justification of needed resources as a secondary objective.

The emphasis should be on collecting and analyzing information and introducing that information into a flexible framework to serve as a road map for library development. Strategic planning should encompass judgemental decision-making in relatively open systems, recognizing the complexity of the internal organizational atmosphere and external environmental decision-making. Solving specific problems, on the other hand, should take advantage of available analytical models in order to improve the rationality and quality of needed decisions.

II. A STRATEGY FOR LIBRARY PLANNING

Library planners are faced with a dilemma--the need for long-range commitments of resources and organizational endeavor in the face of a dynamic environment and future uncertainties. A successful planning approach must build an understanding of the library's current capabilities as an essential first step to identifying future directions. Several such library planning models are available, e.g. Webster[4], McGrath[5], and Kemper[6]. While these models vary in sophistication, they deal with several methodological characteristics concerning scope, time frame, nature of decisions, and level of staff involvement.

The scope of a planning effort influences the complexity, generality, and products of the activity. A comprehensive master plan for the library will outline mission, continuing objectives, and priorities for the entire organization. This activity requires a broad perspective and an understanding of environmental variables. Project planning, on the other hand, deals with an immediate issue such as building a new library

facility or implementing a new circulation system. Scheduling techniques such as critical path method (CPM) or Program Evaluation and Review Technique (PERT) can be usefully applied in the later instance. These techniques define work to be done, schedules to be maintained, and estimates of contingencies within a precise mathematical network.

The time frame of the planning has a great influence on the activity. Long-range, strategic planning deals with decisions regarding broad technological and organizational developments. Short-range planning is oriented toward more limited decisions, such as changing the length of the loan period or introducing a library instruction program. Again, quantitative methodology can apply more easily to the shorter range decisions. For example, data on user behavior can be applied to loan policy and collection acquisition decisions.

The nature of decisions also influences planning strategy and resources. Planning can range from introducing major innovative programs to resolving repetitive problems. In order to introduce machine-based information services, for example, library planners must assess sophisticated technology, understand user needs and willingness to use new modes of access, and evaluate the viability of a pricing system for library services. These issues are strategic in nature and in some instances require philosophical reflection. Bibliographic searching policies and procedures, on the other hand, are intended to provide guidance in making periodic decisions on use of time and proper execution of work. These issues involve job design and work flow which are classic managerial concerns dealing with efficiency and productivity.

The level and nature of staff involvement required in decision making and planning is important. Fundamental shifts in library policy require distributed understanding of the pressures for the change. In addition, information needed for good decisions is frequently spread throughout the organization. Staff involvement in the immediate problem-solving processes, when managed properly, can generate ideas, information, and commitment that will make a difference in the quality of any decision. Libraries based on traditional organizational concepts of specialization, departmentalization, and centralized decision-making will contain staffs possessing narrow perspectives, and generally such staffs are not aware of external pressures working for change. In order to obtain constructive, useful, focused staff involvement in planning, there is usually a need for a structured problem-solving process and training in the associated analytical, research and communication skills.

Strategic planning, if done at all, is generally viewed as a top management responsibility. While planning at the top can result in creative, fresh ideas and certainly gets the broadest perspectives - directed toward critical issues, the results may not be implemented because of staff apathy and resistance. On the other hand, operational planning is done more frequently in libraries from the bottom up, with the front line supervisors assigning tasks and establishing priorities. This works because these supervisors have the best information on client needs, organizational activities, and performance expectations. Because this is where the work gets done, most planning ends up being accomplished at the operational level by people other than top management. However, this planning is not easily coordinated or conducted in the best interests of the entire organization. Since the planning is mostly of a short

term, operational nature, consistent and significant change in library capabilities is limited. On the other hand, combining executive leadership and operational staff capabilities in a planning process that recognizes roles, responsibilities, and contributions can produce powerful stimuli for controlled and substantial change in library practice. Therefore, in designing any significant planning cycle, attention should be placed on combining the competitive benefits of the top-down and bottom-up approaches to planning.

These several dimensions of planning--scope, time frame, nature of decision, and involvement of staff--must be considered in the development of a planning strategy. Recognizing these dimensions, planners will be able to focus on the critical issues and to apply the best, most appropriate quantitative and computational techniques.

III. CRITICAL ISSUES IN PLANNING PROCESS

This section will address on some of the critical issues that demand our best thinking, namely the information system needed to support strategic planning, the allocation of resources, the analytical approaches to understanding the library environment, the relationships of organizational processes and climate to effective planning, and the assessment of library performance.

A model for conceptualizing academic libraries presented in figure 1 portrays the nature of large libraries in terms of the inputs (i.e. resources) required to operate them, the managerial processes utilized in their operation, and the expected outputs from these processes.

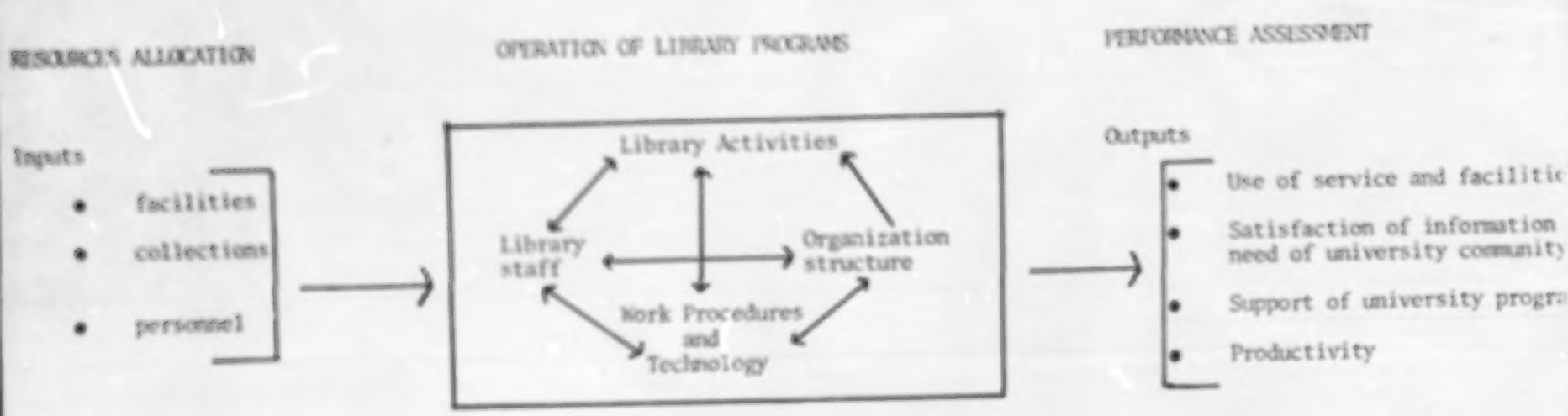

FIGURE 1- A SYSTEMS VIEW OF LARGE LIBRARIES

A systems view of large research libraries illustrates that these organizations possess multiple relationships among the work to be done, the processes and techniques for doing the work, and the end results. A comprehensive planning framework should approach the library as a complex, dynamic system with interdependent relationships and changing characteristics.

--Insert Figure 1 Here--

A. Strategic Planning Information

The term management information system is a label used to denote a range of means for collecting, processing, and distributing information on the operation of each of the components of the library model (i.e. inputs, programs and outputs). The information system to support future-oriented planning should transcend organizational lines, show trends, and cover a significant time-frame, avoiding minute details. The key in this process is to prepare for anticipated change. This type of information can be contrasted with very detailed, past-oriented managerial control information which is more concerned with shorter time periods and follows organizational lines. The purpose of planning information is to support decisions on the allocation of resources and to help achieve effective performance; control information is aimed at measuring and improving efficiency.

A critical element here is defining what the library should do. In the past, strategic decision-making centered around line functions, organizational units, and historical activities. Because of limited monies and a demand for increased effectiveness and accountability, new ways of

viewing the core activities and programs of libraries are being developed. Library objectives can be defined at several levels of specificity as a focus for planning. Traditionally, libraries have seen themselves as responsible for securing collections, creating and maintaining bibliographic structures for these collections, and then servicing and managing the collections. Increasingly, libraries are defining their primary mission as providing access to information needed by clients. In this setting, core library programs are viewed as the means for accomplishing this mission. The following example illustrates how a planning project characterizes library objectives. The Hamburg Study[7] of a Library Based Statistical Information System employed an outline encompassing: (1) providing physical facilities, (2) providing access to documents within the library, (3) providing access to documents in other libraries, (4) providing aids in identifying and locating documents and information promoting library use, and (5) planning, administration and support. Every activity a library performs can be classified under one of these major objectives.

The way programs are defined is of fundamental importance in any subsequent effort to develop a supporting information system or to assess performance. The program definition focuses attention of planners and operators on the essential activities of the organization. In the process of defining what is central, judgements must be made on what is secondary. The resulting priorities and emphases can do much to influence library success.

Libraries do a great many things at the same time. These tasks vary widely from routine work, such as reproducing catalog cards, to rather sophisticated professional challenges, such as, designing a bibliographic search strategy for a Ph.D. student. It is very difficult to sort through the range of activities, objectives and programs to determine which are essential and which contribute most to long term goals. The planning process can accomplish this since it takes into account the relationship among immediate work, long-range goals, and pressures for change. The supporting planning information system must start with a clear articulation of these elements. Since libraries generally have a clearer view of what they are doing than their goals, one approach is to review present practices, specify activities, and define (when possible) quantifiable performance measures. This was accomplished in an ARL study at McGill University Libraries[8] in a way that led to preparation of system-wide library objectives.

Another important aspect of the information system is data on costs--their identification, measurement, and relationship to programmatic activities. Defining and grouping costs by program is not a recent development. PPBS as a management technique is well known. However, few operational efforts have implemented such concepts, and most university accounting systems do not have the capability of providing such data. In at least one instance, the expense of using this technique called into question the value of the result. Regardless, strategic planning that focuses on programs must secure information on what it takes to operate these programs before rational reallocation decisions can be made. The cost of specific library activities can be measured and distributed

to library programs, but the traditions of line item budgeting and incremental increases based on organizational structure tend to work against this.

A variety of library program cost structures have been attempted which identify and relate costs to corollary library programs independent of library organizational structure. To date, the best examples of this are the Columbia Program Expenditure Project[9] and the Joint University Libraries (JUL) Project[10]. The JUL system is based on process cost accounting. This is a method for applying historical cost and performance data to the measureable outputs of the several functional activities of the library. The Columbia University Program Expenditures Analysis Project was not a full fledged costing study since it did not take into account overhead costs supported by the university (i.e. cleaning services, electricity, security guards). Instead, the project collected and analyzed information on staff time and actual line item budgeting expenditures distributed according to a definition of program activities. These programs are information services, bibliographic services, and document delivery services. Ultimately, all expenditures are assigned to service units.

Cost information is based on the libraries' past experiences. These data are useful primarily for control and problem identification purposes. In some instances, this information may be translated into an expectation of what might happen in the future. It is at this point that the information becomes useful for strategic planning and dealing with issues such as: given past experience, what can be projected for the future.

B. The Allocation of Library Resources

Libraries have three key resources: trained people, collections of recorded information, and facilities/equipment. Determining the optimal distribution of limited resources has long been a concern of library managers. In most libraries, an incremental approach based on historical patterns has operated within a line item budgeting process. The ARL's Systems and Procedures Exchange Center (SPEC) surveyed large research libraries and reported on current practices of allocating resources and maintaining budgeting systems in SPEC Flyers #31[11] and #32[12].

Recent studies concerned with library resource allocation include Hamburg[13], Raffel and Shishko[14], and WILCO/NCHEMS[15]. Morris Hamburg developed an allocation model for the Free Library of Philadelphia based on the concept of document exposure time. The Raffel and Shishko study at the Massachusetts Institute of Technology operated as a library cost-benefit analysis. These ambitious efforts, however, have proved difficult to implement in operational settings for some of the reasons noted earlier. In addition, the process of resource allocation in libraries is constrained by the obvious reality that the planner does not have much flexibility in making budgeting decisions. At least 80% of libraries' resources are committed for use because of the nature of these large organizations. For the most part, incremental decisions are the pattern. As examples, should interlibrary loan services be budgeted at $55,000 or $75,000; should serials comprise 60% of the printed materials budget or 90%; should the business library take a cut while the Slavic collections receive an increase.

A library manager needs some criteria for making such allocation decisions. Historically, the political process has worked best but in a period when almost all parts of the library are experiencing cuts, the rationale for decisions must be clearly understood and arrived at in an open process. One of the best approaches for doing this is examining measures of performance for various programs.

C. Assessment of Library Performance

Once programs are defined and costs associated with them, then attention turns to outputs. Better ways of defining and measuring the performance of libraries is the target of much lot of management thinking and research today. The concern is very closely related to defining the objectives of the library because defining what we want to accomplish leads to knowing when we are successful. Within the strategic planning process, appropriate performance measures are needed to determine whether a particular decision or course of action is good or bad and whether the limited resources of the organization are being used in the best ways.

Other enterprises have clear-cut and widely accepted measures of performance that serve as focal points for decision-making. Libraries, on the other hand, have relied on gross measures of collection size, growth, and use, which have minimum value for defining success. As libraries are forced to rethink basic purposes, functions, and resource distribution, there is increasing need for useful quantitative information on output measures. The first step is to identify and describe key measures of effectiveness such as: How well does the library meet users needs; what percentage of user information needs are not satisfied by the library;

how do users view the library; what are the critical performance requirements/ expectations of the university; and what is the relationship of outputs and benefits to costs for key activities.

There are at least three categories of library outputs. First, there is information on internal library productivity such as: volume of activity, work flow, and elapsed time. This information, concerned with establishing meaningful performance goals for operational managers, might cover how long it should take for a book order to be placed and filled, how many bibliographic units should be processed by a department within a given time, and the number of original bibliographic records prepared per professional. ARL member libraries processed an average of 64,800 volumes into their organizations last year but frequently were unable to determine the number of items added to support the university English literature program or the through-put time for a text on economics. Aggregate data on productivity are available, but frequently not designed to assist decision-making, to evaluate performance, or to resolve problems. Most productivity data are simply not needed in the way they are accumulated and reported. Furthermore, useful productivity data often are unavailable on an institutional basis for comparison purposes or, in the department where the line managers need to make daily operational decisions.

A second category of outputs is volume and nature of library collection and services use. Aggregate counts of use are not as useful here as amount of use by collection areas and the type of use. For example, in supporting the university instructional program for English Literature, the library's planners need to know the degree to which English Literature majors rely upon and use their subject collection and

the extent to which the collection supports other majors. A corollary concern is what differences exist between graduate and undergraduate use.

Planners must understand the variables that influence library use. Most research to date indicates that the probability of a book being used declines with age. In fact, if a book is not used once in its first seven years in a library, there is less than a one percent chance that it will ever be used. Furthermore, Trueswell[16] demonstrated that 20 percent of a university library's collection accounts for 80 percent of its circulations. These data can be used to make circulation, storage, acquisition, and duplication decisions.

William McGrath[17] studied 12 independent variables such as pure vs. applied sciences, level of enrollment, number of advanced degree programs, and size of collections to determine predictability of use. He found that books already in the library coupled with the number of masters and upper level students enrolled in courses in each department are fairly accurate predictors of how much of what gets used. The implications of McGrath's research for collection building are clear. The library planner must be able to identify the curriculum and develop the collection accordingly. Credit hours and enrollments should act as guides to collection development if circulation is viewed as a valid measure of performance.

Methods of relating patterns of collection use to acquisition decisions do exist[18]. If the goal is to maximize use despite a budget cut, then the use data should be related to the decision process. If, on the other hand, the goal is to maintain collection excellence,

then relating budget cuts to historical and current strengths, university research and instructional programs, and availability of materials elsewhere will allow decision-makers to deemphasize or drop a collection area deserving greater inter-institutional cooperation. A methodology for doing so is being developed by the Association of Research Libraries[19]. In the end, however, judgmental assessments are needed to determine where to secure savings and where to redistribute them internally to gain improved performance.

The third category of outputs concerns measurement of user benefits. The value of a library to its clients frequently is related to satisfaction of users' expectations and the view users have of the library's responsiveness to their needs. User satisfaction is a complex set of perspectives, values, expectations and experiences. Various studies of user success have found that about half the people trying to find a book in a library are successful. Thus, clients are dissatisfied with library service half the time. The question now is can library planners improve this situation. A recent study by Saracevic, Shaw and Kantor[20] examined this problem by dealing with four variables: acquisition (did the library buy the needed item), circulation policy (was the item in use already), library operational failure (was the item misfiled, lost or stolen), and user error (did the user make a mistake in trying to find the item). This approach allows planners to deal intensively with each variable, taking corrective action that can improve the probability of success. The Academic Library Development Program[21] examined the issue of user satisfaction by analyzing and documenting user attitudes toward the library. Using a marketing technique called semantic differential, the study inventoried the users' images of the library. This allowed the project team to identify attitudinal

patterns and pockets of discontent, which helped the library pinpoint problems and plan a response.

One procedure that attempts to relate several output measures within a managerial decision-making framework was developed by Hofmann, Altman and Beasley for public libraries in the United States[22]. In this instance, the variables of availability of materials, nature of users, activity level, facilities, library programs, and user satisfaction are studied with comparable data produced to aid in the planning process.

C. Analysis of library environments

Another critical challenge for library planners is improving the processes used for analyzing library environments and forecasting future needs. Forecasting future requirements for library performance requires good information on the trends and developments of society, the economy, the profession, and the client system. Libraries typically learn about changes in the environment as they are occurring and deal with the consequences of these changes for library programs. For example, a new professor of Scandinavian literature is added to the university and the library is expected to support this research interest, although historically little emphasis has been placed in the area. This static mode of coping with change must be replaced by more actively understanding and influencing developments in institutional practices. Furthermore, the political and pragmatic aspects of a library's environment require quantitative data that can be complemented with an understanding of who makes decisions and what influences them. Useful comparative data on the characteristics and performance of other, similar libraries can assist in projecting future plans.

There are examples of libraries attempting to analyze their environment. Information on trends is available from sources such as Fowler's Past and Likely Future[23], which utilizes time series analyses to provide a statistical portrayal of patterns in library collection growth. Recently, the Council on Library Resources sponsored a study by Hamlet and Murray, which produced a publication entitled Economics of Academic Libraries[24]. This study combined time series analyses and multiple regression analyses to produce a method for forecasting academic library budgeting and staffing needs. In addition, there are data available from the Association of Research Libraries' Academic Library Statistics, and the Ingle Statistics.

A project currently sponsored by the ARL Statistics Task Force is aimed at updating the Hamlet/Murray formula using data from ARL academic library statistics. A computerized program applies regression techniques to ARL statistics in order to analyze relationships between the variables identified in the Hamlet study[25].

One of the most frequently applied processes for analyzing the environment is the ARL's Management Review and Analysis Program[26]. This management self-study has been conducted by 23 research libraries to date. One of the modules in this study provides procedures to examine external forces that have an impact on internal activities. The study team identifies forces in the university as well as trends in society, the economy, the profession, and technology. The study team uses analytical methods to determine implications of this information for library planning and then makes recommendations for dealing with these implications.

B. The Impact of Organizational Climate on Library Planning

A critical challenge facing library planners concerns organizational processes and climate. In this area, planners must be aware staff attitudes and consider how these perspectives affect library performance. This assessment leads to a better understanding of organizational behavior and the relationship of staff needs to organizational problems. An essential first step in relating organizational goals to individual goals, techniques available for doing this include those described in the MBO Management Review and Analysis Program's Organizational Survey[27]. In this instance, an attempt is made to determine staff understanding and attitudes toward leadership style, decision-making, problem solving, organizational training, and performance review. Once attitudes are documented, efforts can be designed to deal with those issues/problems that are resulting in undesired or unproductive attitudes. Another technique that has a similar orientation is Rensis Likert's Organizational Profile Scale[28]. The idea behind the collection and analysis of information on organizational processes is that substantive change, such as the introduction of technology and innovative organizational strategies must be done with an understanding of the readiness and willingness of staff to accept and deal with the different circumstances.

C. The Role of Decision Models and Computers in Library Planning

In the past decade, a number of different types of decision models have been developed for libraries. These have served to represent what actually occurs or will occur in the library, and the relationships between the elements of operations and systems in the library.

The decision models also project the impact alternative decisions may have on library operations. Some administrators have found decision models to be useful tools in both the decision-making and planning processes, particularly in such areas as collection development, building and space planning, and some organizational tasks. Types of decision models that exist include: (1) Informal Models-- management decisions are based upon systematic data collection and analysis; (2) Simple Formal Models--such as analytical formulas, standards, guidelines, and rules of thumb; (3) Operations Research Models-- decisions are based upon formal operations research techniques such as linear programming, queuing theory analysis, dynamic programming, and statistical models; and (4) Simulation Models-- decisions are based upon complex computer simulation models. To date there is little evidence that operations research or simulation models have won acceptance by library managers.

Computers have made it possible for library managers to organize, analyze, and use information in new and interesting ways. The more specific the problem, the more valuable are numerical and quantitative methods. Computers play a large role primarily because they are useful in operating systems and in collecting information on the operation of these systems. Better information can then be plugged into the decision-making framework. For example, computerized circulation systems can enlarge the store of information on how users utilize collections, as illustrated by Ohio State University's circulation system[29].

There is also a need to consider Management Information System (MIS) applications of computer systems, such as the one at the University of Chicago[30]. These computer systems are designed to streamline library

activities including shared cataloging, acquisitions systems, and circulation systems. The tendancy is to treat MIS as a fringe benefit rather than as a way to integrate data into a coordinated management decision-making process, but the availability of computerized data has stimulated some interest in manipulating that data. However, this experimentation can be very costly. In order to take full advantage of it, planners must take into account managerial needs and the economics of providing such information.

With the advent of operational computerized library systems, a number of exciting and innovative developments seem possible. The question is how to build in the flexibility needed to cope with a rapidly changing environment. This requires that computerized systems provide more information rather than simply control it. They need to be tuned toward the future to be useful for planning now.

The concept of operations research and management science can be fully exploited only if there are easy ways to do complex things with large amounts of data. For example, adjusting length of book loans based on the frequency of use of individual items can be accomplished automatically with a computerized circulation system. With the availability of computers and large amounts of information on library operations, managers can spend more time defining the problems, interpreting the results, and deciding on an optimal decision-making process.

VI. CONCLUSION

Libraries can be viewed as dynamic systems encompassing the elements of inputs, operating programs, and outputs. Planning approaches in the past were mostly ad hoc efforts that emphasized getting more financial assistance for libraries and dealing with problems and crises as they occurred. The current directions of management thinking in libraries focus on (1) defining library programs in a way that costs and benefits can be associated; (2) anticipating and influencing developments in the environment that affect internal operations; (3) conceiving better measures of library performance that can provide useful information for strategic decision-making; (4) adapting available quantitative techniques such as systems analysis, operations research and statistical analysis to operational planning; and (5) tuning organizational climate to accommodate change.

The potential for change and improvement in library performance is greatest in two areas. First is the development of improved measures of performance that allow planning processes to allocate resources more rationally and make available control information on the relative success of the programs. To do this, libraries need to create a planning capability. American libraries have experimented with separate planning offices, planning groups, and specialized projects[31]. While these have been successful in some instances, others have failed to come to grips with fundamental issues or have failed to produce substantive change in library operations. The best way of establishing a planning capability has not yet been defined.

Also needed is the development or acquisition of specialized skills to operate sophisticated planning systems. Few library staff members have any experience with mathematical or computational techniques. Few have had any experience with operations research models. Few have had a chance to use statistical methods in making decisions. This need can be met by simplifying these methods and by providing training programs that can be operated in libraries and aimed at immediate organizational problems.

The second area relates to the way libraries manage and utilize their staffs. With stable and declining budgets, the need to do more with less requires the best professional thinking to be oriented toward realizing staff potential. The responsibility for planning belongs to top management. The successful planning system, however, recognizes the contributions of all managerial and supervisory staff. The planning strategy should include carefully defined roles and responsibilities for key staff throughout the organization. Within this setting, recognition should be made of the scope, time frame, and nature of decisions that can contribute to both strategic, overall planning and internal operational or tactical planning.

Planning processes are available to libraries. They are not fully used primarily because thinking about current tasks tends to drive out thinking about long-range goals. In addition, there is a general lack of training for librarians to acquire needed skills, and useful information that is comparable among libraries or available on a timely, affordable basis is limited. The move toward successful operation of continuing

planning processes call for improved training and information, as well as a new definition of managerial roles which includes a commitment to planning.

Academic and research libraries have long struggled with the sometimes contradictory objectives of developing and maintaining comprehensive collections, creating detailed bibliographic records, and directly providing information resources and services to their users. One difficulty, has been the inability of libraries to determine the relative contribution of these three primary efforts to organizational success. This inability is due on part to the lack of effective, generally usable techniques for generating and analyzing data on user needs, level of user satisfaction, costs of library programs and the relationship of program costs to program benefits. While these data cannot substitute for basic judgements which must be made regarding the libraries' purposes and functions, they can contribute to the quality of those judgements and assist in the reallocation of libraries' resources to relate more directly to the achievement of basic purposes.

What may be needed is a willingness to question tradition, confront unrealistic attitudes, and redefine the purpose of the research library. It is not a matter of saying that past library performance was inadequate, but rather that the situation has changed and what was rational and achievable in the past may not be now. An important leadership task will be to influence libraries' constituencies to accept and deal with the same realities.

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